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A Criterion Model for the Study of Interpersonal
Relations in Small Isolated Groups¹

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A. Interpersonal Relations as Part of the Criterion Problem

When we speak of the "criterion problem" in the behavioral sciences, the reference is usually to problems of definition and measurement of task performance effectiveness. This denotative meaning is far too restrictive for present purposes.² The "task" of small, isolated military units, engaged in deterrence missions, includes far more than the performance of man-machine operations instrumental to the mission. Besides the vital tasks of monitoring environmental conditions (including enemy action) and internal life support system, such groups have the crucial task of maintaining all system components in good condition, and maintaining proper relationships (connections) among components.

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1. Men as Well as Machines Need Maintenance

When one is dealing with an "all-hardware" system, it is very apparent that even with the most perfectly designed system, one essential function is the maintenance of all system components in proper working condition and in proper working relation to one another. If a part is found to be broken, or malfunctioning, it must be repaired (or replaced, if that is possible). Furthermore, if observation or testing indicates a condition of incipient breakdown, steps must be taken to prevent such malfunctions. For example, if a component is being subjected to

¹This paper is part of the effort of the "task and criterion" workgroup in support of the Small-Groups-in-Isolation project of the Neuropsychiatric Division, N.M.E.I., Bethesda, Md.

²For a further elaboration of this point see McGrath, J. E. Formulation of a Criterion System for the Study of Small Groups in Isolation, an earlier paper of the "task and criterion" workgroup.

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stress of an undue intensity or duration -- even though it is still performing its function in spite of "wear" -- steps must be taken to remove the source of stress or attenuate its effects on the component. Finally, if it is determined that two or more parts -- each performing their intended functions adequately -- are tied together so that the system (or sub-system) does not operate at an optimal level of effectiveness (and at a minimal level of "wear"), then the relationships among the sub-system components must be altered.

With an "all-hardware" system, however, advanced, there is little doubt about the need for continual and comprehensive (a) maintenance of components and (b) maintenance of proper interrelations among components. When some components of the system are human, however, the need for effective maintenance of the "components" (members) and "sub-systems" (groups) is both more difficult to recognize, and more difficult to achieve. Some of the main reasons for these difficulties are discussed in a later part of this section.

In spite of these difficulties, the need for effective "human maintenance" parallels the need for maintenance of hardware. We can no more expect optimum performance from a man working under extreme or prolonged stress than we can expect such performance from a worn bearing. While it is probably true that the human can often tolerate considerable stress, and compensate for negative effects of stress, it is nevertheless true that his performance is either less than optimum or is done at a greater than minimum cost in "wear".

Thus, part of the essential "task" of small, isolated military groups is the effective maintenance of its members and of the group. This is essential not only from a "human relations" standpoint, but more importantly, it is a necessary condition for execution of mission.

Hence, this paper will ignore other aspects of group tasks, such as those involved in execution of the primary mission, monitoring for and processing of information about the environment, monitoring and maintenance of mission equipment

and life support systems, to concentrate on those aspects of the group's task which have to do with maintaining effective members and an intact group. This focus does not imply that the other aspects of group tasks, such as those listed above, are unimportant. On the contrary, group task activities directly instrumental to mission performance and physical survival are so obviously important that they have received far more attention in past research -- and indeed, in the effort of this workgroup -- than has been given to problems of interpersonal relations and member adjustment. The purpose of this paper is to explore some of the problems involved in formulation of a criterion system for investigation of interpersonal relations and individual adjustment in small, isolated military groups.

2. Difficulties in Establishing Criteria for Effective Maintenance of Human Components

One of the major difficulties in research on individual and interpersonal effectiveness -- and probably one of the latent reasons for lack of attention to these areas -- is a lack of clarity in formulating criteria of "good adjustment" and "good interpersonal relations". Just how do we identify a human component (individual) that is in "good working condition"? And just how do we specify what pattern of connections are desirable among the human components in each subsystem (group)?

The problem of defining adequate criteria of individual adjustment is an especially difficult one, which has plagued the fields of clinical psychology and psychiatry for many years. Clinical definitions, statistical definitions, and normative definitions of adjustment all have serious conceptual and empirical difficulties associated with them. (Lazarus, 1961). Furthermore, different criteria (i.e. specific measures) of adjustment often do not correlate with one another to any appreciable degree (Fiedler, et. al., 1958). (This is another way of saying that adequate construct validity has not yet been established for those adjustment measures.) Furthermore, the whole concept of "adjustment" --- with its homeostatic

connotations of accommodation of the individual to the environment -- has been as a called into question by some, as a criterion of "health" of the individual.

The definition of adequate criteria for identifying "good" interpersonal relations is, if anything, even more difficult and chaotic than the area of individual adjustment criteria. Much research has been done in industrial contexts, for example, on the problem of the relation of "morale" and productivity. These studies, by and large, have not been able to establish a clear picture of the nature of that relationship, or of the conditions under which it varies. Laboratory research on small groups, on the other hand, has shown that there is a very definite relationship between "cohesiveness" and "productivity", though that relationship is complex and is mediated by other factors. (Schacter, et. al., 1941; Berkowitz, 1954).

Human components unlike machine components can compensate for adverse conditions. Men can often function substantially as well (for limited times) when subject to abnormal stressors as when working in the absence of such stressing conditions.

Often, machine components function correctly or not at all. Even when performance decrement is gradual for a machine component, rather than "all or nothing", it is easier to detect because the desired output of a given machine component is limited, definitive, and can be measured with precision. The "tasks" instrumental to maintaining good interpersonal relations do not provide very definite solutions, and cannot be assessed on unidimensional, quantitative continua. "Covert" factors, unavailable to outside observation, and often unavailable to the individual himself, often enter the picture and tend to complicate the problem of determining personal and interpersonal adjustment. We needn't concern ourselves with the "motivation" or "loyalty" of machine components, nor with their "goals", their "values" and their "understanding" of the mission. Attitudes, needs, emotions, defenses, all affect the behavior of the human. Furthermore, man's behavior is affected by his past history -- proximal and distal -- and by his anticipations

about the future.

3. Need for a Criterion Frame-of-Reference for the Study of Interpersonal Relations

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The preceding discussion points out certain difficulties in formulating criterion measures, and indicates that the current state of affairs with respect to criterion measurement in this area is unsatisfactory. It is apparent that a "survey of adjustment criteria which have been used", with an eye to selection of the best and most appropriate for present purposes, will not provide an adequate base for investigation of interpersonal relations and adjustment in small, isolated military groups. Nor is it likely that any single researcher, theorist or consultant, or any small group of them in a limited time, will be able to arrive "intuitively" at "the set of criteria" appropriate for use in the present context. Yet, such a set of criteria is clearly needed as a necessary condition for effective research on small groups in isolation.

What seems to be the crux of the matter is that, before a set of criteria for the study of interpersonal relations can be established, we need much more extensive theory, and much more intensive empirical research, upon which to base its formulation. The development of such theory and the conduct of such research is very far beyond the scope of the present effort -- that is, the effort of the "task and criterion" subgroup for which this paper is prepared. In effect, the development of adequate criteria for the interpersonal relations area is a job which can only result from a major concentration of research effort on the part of the small-groups-in-isolation project itself, for which this workgroup is attempting to develop guidance.

Hence, rather than try to "find" (in prior studies) or "invent" (via intuition) a set of criteria for the study of interpersonal relations and adjustment, the remainder of this paper will aim at a more modest, but propaedeutic, goal. We will back off from the problem of specification of criterion measures of interpersonal

relations, as such, and will attempt to develop a systematic frame-of-reference for talking about interpersonal relations in groups. In other words, we will try to develop a model which can serve as a tool for systematic description of interpersonal relations. The constructs of this model will not be criterion constructs in themselves, for the specification of criteria requires value decisions about what kinds of interpersonal relations are desirable for given groups in given situations. Rather, the concepts of the model, and their interrelationships will provide a language for descriptive analysis of how interpersonal relations do work in groups. Superimposition of criteria for what kinds of interpersonal relations are desired, and of manipulations (in composition, organization, environment, etc.) intended to achieve such desired patterns, are research activities beyond the scope of this presentation.

Like any model, we must first specify our terms of reference and establish what the "elements" of the model are to be. Then we must establish how those elements are related to one another and to other features of the group-task-situation. These two tasks -- the search for appropriate elements for a model of interpersonal relations, and an analysis of those elements as a system -- are the subjects of the next two sections of this paper. The final section of the paper is concerned with more or less rigorous formulation of a set of propositions -- the model itself -- which seem to offer a useful reference base for analysis of interpersonal relations in small, isolated groups.

B. A Search for Elements of the Interpersonal Situation

From the preceeding section it is apparent that the area of study of interpersonal relations is fuzzy, at best, and is quite complex. To formulate a model of anything, one needs some basic terms, or elements, or unifying concepts, as a starting point. It is not at all clear what the "basic elements" of interpersonal relations are. There is now a very formidable body of literature dealing with interpersonal relations in groups -- generated from work of clinical, social and industrial psychologists, anthropologists, and practitioners from many fields. At this point, however, we are far short of having a definite set of basic concepts on which there is general agreement. Yet there seems to be certain common themes running through the work of many theorists and researchers, and these probably represent a relatively useful foundation on which to build our model. So, let us examine the interpersonal relations concepts of several theorists in this area (and related areas), with an eye to noticing the similarities or common features running through their formulations. At the same time, it is probably useful to consider, as we examine each set of concepts, some of the major conceptual and operational difficulties which they present. The purpose, here, is to attempt to identify a set of organizing concepts which emerge from cross-comparison of several formulations; and, at the same time, to identify some of the limitations and complexities involved in the use of those concepts for systematic investigation of interpersonal relations in groups.

1. Schutz's Formulation of Interpersonal Needs

One of the more systematic attempts to delineate the major categories of interpersonal relations is by Schutz (1958; 1961). He asserts that there are three basic interpersonal needs: inclusion, control, and affection. Furthermore, he contends that individuals differ in the amount of inclusion, control, and

affection which they need to give to others, and in the amount of each which they need to receive from others. Moreover, the amount of inclusion, control, and/or affect present in a given interpersonal situation can be less than or in excess of the amount suitable for a given individual, or can be within his desired level.

From these three needs (inclusion, control, and affection), their two reciprocal aspects (giving and receiving), and the three possible "values" for each (too little, enough, too much), we can identify 18 distinct interpersonal conditions from the reference point of any one individual in relation to another person or group.

When Schutz applies his interpersonal categories to the group situation (Schutz, 1961) he suggests that interpersonal conditions within the group should be distinguished from interpersonal relations between a group member and individuals external to that group. The addition of the distinction as to referent of the interpersonal relations increases the number of possible interpersonal relations conditions to 36.³

Schutz (1958) has developed instruments for reasonably sound measures of the desired levels of these three interpersonal needs. Given fully adequate measures of the amount of each of these needs which individuals desire (to give and to receive) and which they perceive to exist in various interpersonal situations (vis a vis the intra-group and extra-group referents), this 36 category schema might serve as a useful frame of reference for the study of interpersonal relations in small, isolated military groups. Clearly, these three interpersonal needs have to do with areas likely to pose serious problems in such groups. For example, long-run isolation (physically and in terms of communication) will pro-

³Schutz (1961) identifies the task, or "conflict free" area, as a third referent in addition to intra-group and extra-group relations. However, this deals with a person-task relation, not with a person-person relation, and hence is not of concern in the present context.

vide a serious dearth of opportunities for feelings of "inclusion" and "affection" with respect to persons outside the group. At the same time, it may well provide feelings of too much inclusion (lack of privacy), and too much control (lack of autonomy), with respect to persons in the isolated group.

However, there are certain conceptual and methodological difficulties with this schema which may limit its usefulness for present purposes. First of all, Schutz's theoretical basis (Schutz, 1958) for identifying these three needs as the only (or primary) generic interpersonal needs is reasonable but not entirely compelling. They appear to have been deduced, rather than induced, and the empirical documentation that these three needs substantially exhaust the important interpersonal need areas is relatively weak.

Similarly, it is not altogether clear from empirical data that these three needs are orthogonal to one another, and it is certainly debatable that they are conceptually distinct. For example, one behavioral manifestation of "inclusion" of A re B might be "interaction of A with B." Similarly, an operational definition of "control" of A re B might be "influence of A re B" or "attempted influence of A re B". Given these operational definitions, it would seem that inclusion and control are necessarily related, since influence (at least direct influence) implies interaction. Alternatively, one might define "inclusion" in phenomenological ("felt acceptance") terms rather than in behavioral ("interaction") terms. If so, then "inclusion" becomes confounded with "affection" at the conceptual level, and certainly at the empirical level (e.g. Fiedler, et. al., 1959; McGrath, 1962).

2. Parallels Between Sets of Interpersonal Relations Concepts

Some support for Schutz's triadic statement of interpersonal needs is to be found in the work of others on related problems. Osgood has repeatedly found three basic dimensions in perception: activity, potency and evaluation

(Osgood, et. al, 1957). While the context is quite different, there is a marked similarity between matched pairs of concepts. In a group interaction context, Schutz's "inclusion" and Osgood's "activity" are both closely related to participation or amount of interaction. Similarly, "control" and "potency" are both intimately tied to interpersonal influence. In an interpersonal situation, Osgood's "evaluation" and Schutz's "affection" both have to do with the same parameter of valence or attraction between persons. However, Osgood, too, has encountered problems of non-orthog³onality in his measures of these three dimensions, with activity and potency especially likely to be non-independent or to be confounded with evaluation.

Hemphill (1950) has also factored out three primary dimensions of interpersonal relations, in the context of leader-follower relations. Here, again, there is a striking similarity between Hemphill's and Schutz's categories. "structure-in-interaction" closely matches "control"; "consideration, in the case of member perceptions of a leader, is somewhat akin to "affection" in peer relations; and "sociability" seems to overlap substantially with "inclusion".

A number of other researchers (e.g. Borgatta (1958), Carter (1951), and Bales (1955) have also found three primary dimensions of interpersonal relations. Their sets of dimensions differ somewhat from one another, each being based on factor analysis of different panels of variables under somewhat different sets of conditions. But the overlap among them, and between each of them and the Schutz formulations, are more striking than the differences. For example, concepts such as "individual prominence", "assertiveness" and "participation rate" are certainly related to an interactional meaning of "inclusion".

3. Three Unifying Concepts but Many Complexities

Indeed, several key concepts appear to emerge as a starting place for a model of interpersonal relations. First, individuals appear to differ in their predis-

positions to interact, or participate, or "be interacted with", in interpersonal situations. However, this predisposition is relative -- both to the relative "attractiveness" of the available interaction partners (Newcomb, 1962), and to the relative interaction rates of those potential partners (Borgatta, 1959). Hence, it is probably desirable to represent this predisposition to interact, within a model of interpersonal relations, in terms relative to the interaction proclivities of the available partners, rather than to represent it grossly as a stable "trait" of the individual. The latter course is perhaps useful for many purposes, as reflected in the work of Schutz (1958), Hemphill (1950) and others; but it does not seem appropriate as the basis for a model of interpersonal relations in a closed "ecology" such as we are concerned with in the present context.

A second key concept which seems to emerge from a variety of studies is that individuals vary in the extent to which they influence or are influenced by others. Here, Hemphill's distinction between "attempts to influence" and "successful influence" is crucial. Person A's "need to control" others, in Schutz's scheme, is related to A's "attempts to influence" B; but A's "need to be controlled" is related to B's "successful influence" of A (given that B does interact with and attempts to influence A). Back's (1961) distinction between influence and authority is also pertinent. In Back's formulation, influence has to do with effects on the attitudes of another, while authority has to do with modifications of the behavior of another. The latter concept has the implication of coercion, or forced compliance (Festinger, 1957), which does not necessarily carry with it changes in attitudes.

The predisposition to influence and/or be influenced is also relative. For a given individual, A, the probability of his attempting to influence (and/or of his being influenced) varies with: (a) A's attraction (affect) toward the potential target (or source) of influence, B; (b) A's perception of his status relative to B; (c) the joint predispositions of A and B toward interaction, which is

a necessary condition for receiving or attempting influence; (d) the state of agreement between A and B on the subject(s) about which interaction is (or may) occur (Back, 1951; Thibaut, 1950; Newcomb, 1952); and (e) structural aspects of the social and physical environment (Sherif, 1935; Asch, 1949).

Thus, as was the case with "predisposition to interact", representation of a "predisposition to influence" or a "predisposition to be influenced" as a stable interpersonal trait of the individual is probably too gross for an effective model of interpersonal relations in small, isolated groups. Rather, the probability of flow of influence between individuals must be represented in our model in terms which take the above factors into account, even at the cost of considerable complexity.

A third key concept which seems to emerge from many analyses of interpersonal relations (and which is implied in much of the foregoing) is that individuals develop attraction or affect relationships toward one another which (other things equal) tend to persist. These can be positive or negative in direction; in fact, A can have both positive and negative (ambivalent) feelings toward B. Furthermore, individuals seem to vary in their tendencies to develop positive (or negative) attractions to others-in-general (McGrath, 1962).

However, for any given individual, A, his attraction to another person, B, depends on a number of characteristics of B, and of A's perceptions of B. These include: (a) A's perception of their relative statuses; (b) A's propensity for interaction and the relative availability of B as an interaction partner in relation to other potential partners; (c) A's perceived similarity to B (Fiedler, et al, 1959); (d) A's estimate of B's attraction to A (Newcomb, 1952); (e) A's estimate of B's agreement with him regarding important issues (Newcomb, 1952); (f) A's perception of B's power, including power of various forms (French & Raven, 1959); and, probably a number of other factors.

4. Summary: Three Interrelated Elements in the Interpersonal Situation

Thus, interaction, influence, and attraction seem to represent three distinct but interrelated parameters of interpersonal situations. They have both behavioral aspects (in the sense of manifest interaction or communication; attempts to influence; sociometric choices), and phenomenological aspects (in the sense of predispositions to interact, to influence or be influenced, to be attracted to). Each of these parameters is inherently a dyadic or relational concept. The level of each of them which is manifested by a given person in a given situation is a function of a number of characteristics of the potential dyadic partners and of the situation.

The three concepts of interaction, influence, and attraction are interactional analogues of Osgood's three primary perceptual dimensions (activity, potency, and evaluation), of Schutz's three primary interpersonal needs (inclusion, control, affection), and of sets of interpersonal relations concepts formulated by Bales, Borgatta, Carter, Hemphill, and others.

These three terms also reflect the four primary dimensions of group structure as formulated by Cartwright & Zander (1960). Their concepts of communication structure of a group, and its task structure or division of labor, both refer to patterns of interaction, with communication and task activity being specific forms of interaction. Their term "power structure" refers to the pattern of interpersonal influence. Their "sociometric or friendship structure" refers to the patterns of interpersonal affect or attraction.

However, the concepts of interaction, influence, and attraction are intimately related at both conceptual and empirical levels (Newcomb, 1952). Interaction is a necessary condition for influence and attraction. At the same time, probability of interaction between A and B is a function of prior attraction, and perceived power relations between them. Further, influence and attraction are interdependent;

a person is more likely to be influenced by a positively attractive other, and to be more attracted to others who wield influence (power or status).

Thus, these three concepts seem to subsume many concepts and findings from studies of interpersonal relations. At the same time, since they have both behavioral and phenomenological forms, they may provide a fairly useful set of "elements" for a model of interpersonal relations. However, since these concepts are interdependent with one another, and with other aspects of the interpersonal situation, they will only be useful if embedded in a relatively complex model.

C. Analysis of the Structure of Interpersonal Relations Concepts

1. Interpersonal Needs: Desired vs Obtained Levels

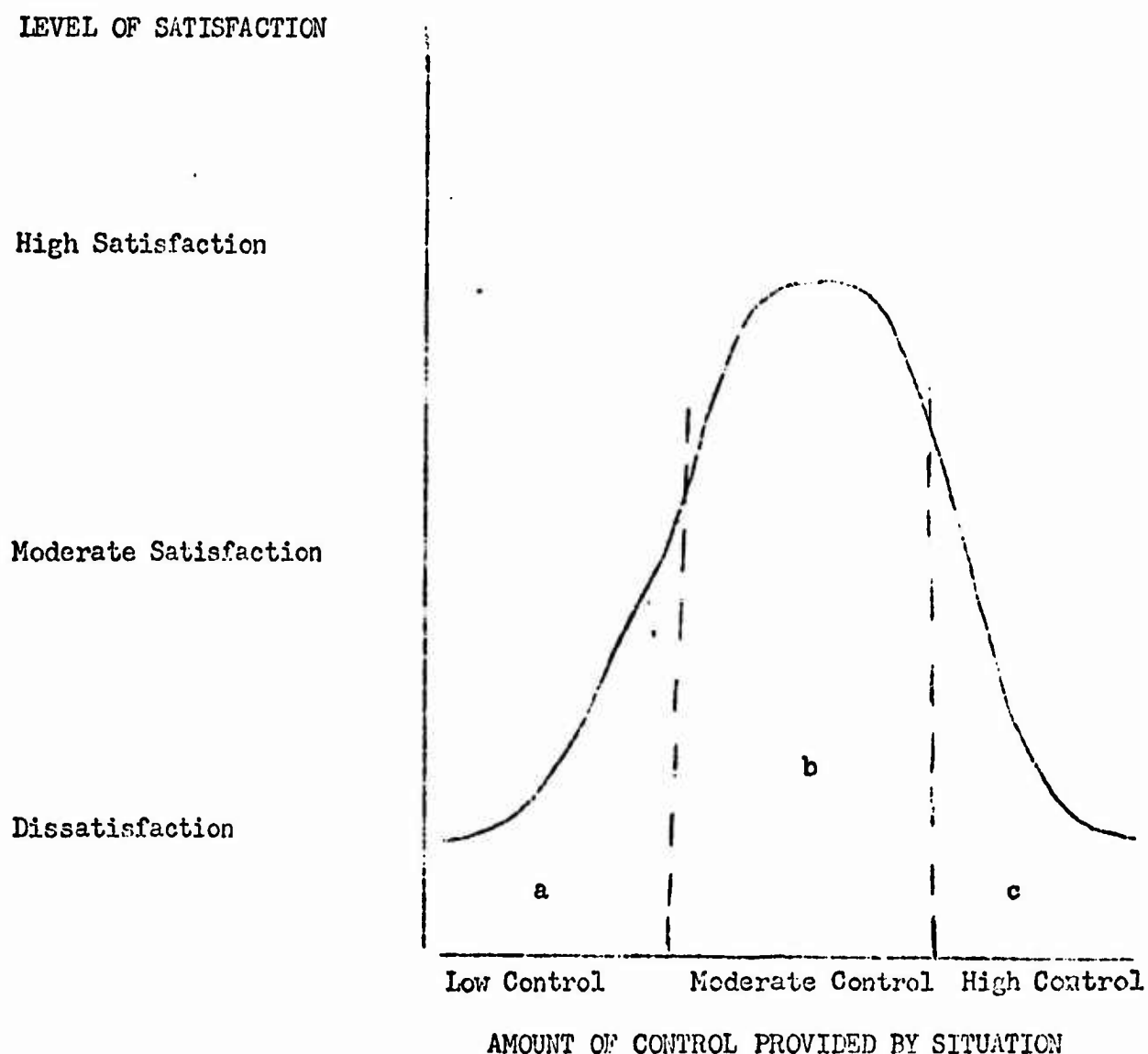
One of the most important features of Schutz's formulation is that he defined interpersonal needs as non-monotonic. That is, these needs (inclusion, control, affection) are not of the sort where "the more the better." Rather, each individual has a desired level for each need, and a given situation can provide too much or too little of any one of them.

This formulation implies that there is a matching between the level of the individual's predisposition with respect to a given need (his "desired level") and the amount of need-satisfaction which his environment provides (or more accurately, which he perceives in the environment). Thus, we might consider that the individual has a desired level of "amount of control received", for example, and has a positive or negative subjective reaction to the situation depending on whether it provides (or is perceived to provide) the right level of fulfillment of that need-for-control. That is, he is satisfied with the situation if it provides the right amount of fulfillment of need-for-control (or any other of the interpersonal needs), and is dissatisfied with the situation if it provides too little, or too much, fulfillment. This relationship is illustrated in figure 1 for "control".

The preceding discussion suggests the applicability of Coombs (1952) distinctions between "task A" and "task B". A "task B" judgment requires a statement of the amount of an attribute possessed by a stimulus object. For example, the judgment "how high is that shelf?" In task B, the stimulus object is placed on a (monotonic) continuum. A "task A" judgment, on the other hand, is a preference or evaluative judgment. It requires a statement of the (relative) distance between a stimulus object and the judge's "ideal" or standard for that (class of) object with respect to some attribute. For example, while task B

Figure 1

Illustration of Schutz's Concept of the Relation of an Interpersonal Need (Control) to Satisfaction with the Situation



- a --- This region has "too little" control for a given individual.
- b --- This region has an amount of control suitable for a given individual.
- c --- This region has "too much" control for a given individual.

might ask, "How high is that shelf?"; the related task A question might be, "Is that shelf at the right height?", or "How far should that shelf be raised/ lowered?" The latter questions imply that the judge is comparing the stimulus object with a (subjective) standard or ideal, with respect to the attribute of height, and is reporting how far the object departs from the ideal (or how closely it matches the ideal).

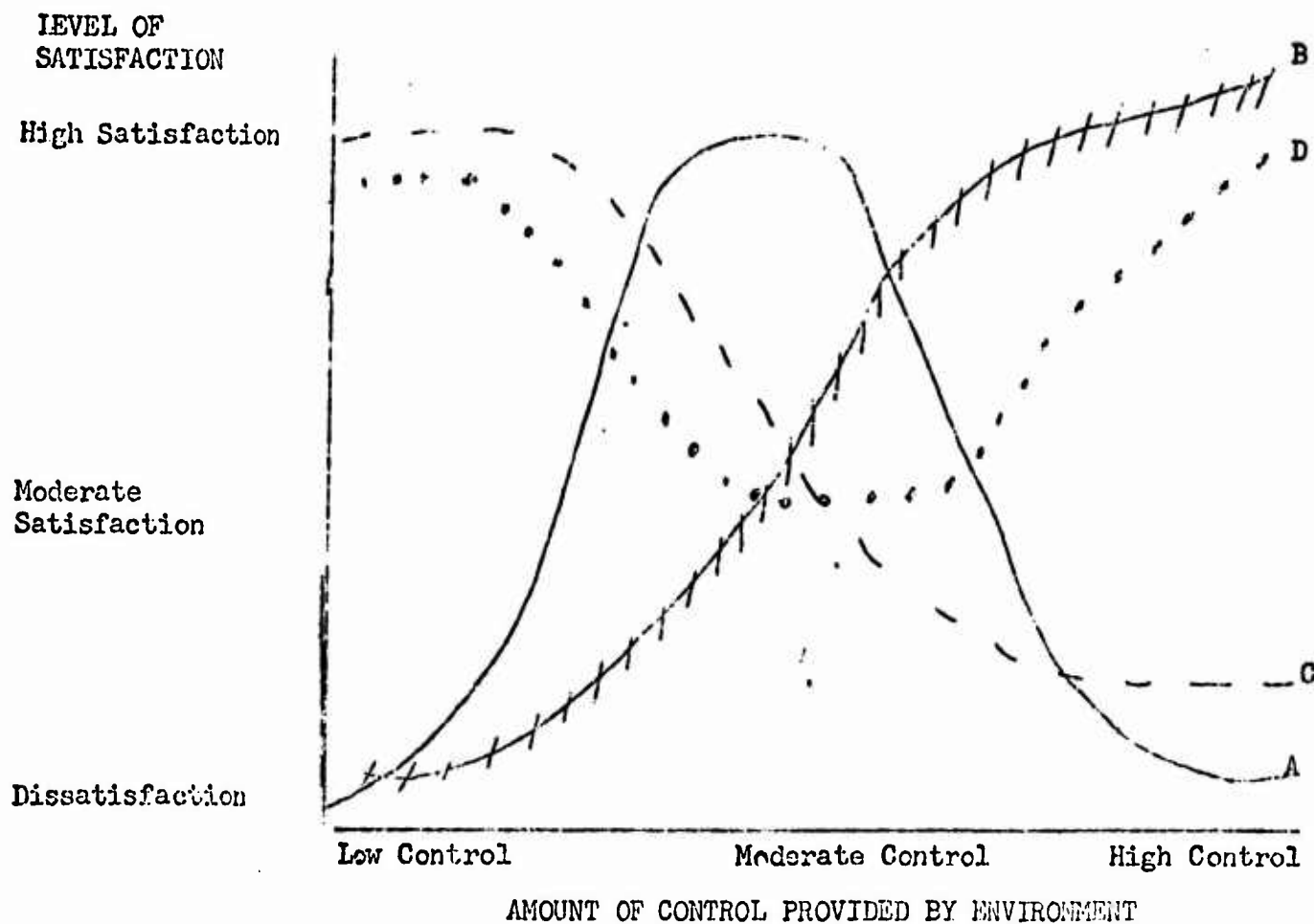
Task B judgments, if based on fairly clear-cut attributes, should be highly consistent from one observer to another. In an interpersonal situation, for example, the "amount of interaction" can be determined with considerable precision from direct observations and/or recordings. Task A judgments, however, are inherently subjective since they involve the comparison of the stimulus to a subjective "ideal", which presumably varies from one individual to another.

Schutz's concept that individuals vary in their desired level for each interpersonal need clearly refers to a task A type judgment. His implication that situations vary in the amount of opportunity which they provide for fulfillment of a given need implies a task B type judgment. That is, it suggests that the amount of such fulfillment potential in a given situation can be specified independent of the "desired amount" of any given individual.

However, Coombs formulation as applied above permits the individual's ideal to vary along the full length of the attribute in question, while Schutz seems to imply that the "desired level" is always at intermediate portions of the scale. This insistence on a non-monotonic formulation is clearly better than one which insists on a monotonic form only (that is, "the more the better" or "the less the better"). However, it would seem more useful to build a model utilizing both possibilities. Thus, an individual whose "ideal" is at the extreme high end for a given need would find most situations to have "too little", and none to have "too much". (For instance, the stereotyped "authoritarian personality" might respond this way with respect to "control". See figure 2.)

Figure 2

Illustration of Multiple Types of Relation of an Interpersonal
Need (Control) to Satisfaction with the Situation



A _____ Person for whom situation may offer "too little" or "too much" control (as in Schutz's formulation).

B///// Person for whom "the more control the better" (e.g. authoritarian personality).

C----- Person for whom "the less control the better" (e.g. bohemian).

D . . . Person for whom complete structure or complete freedom is desirable but partial control is not (perhaps a hypothetical type only).

Another individual might have an "ideal" at the very low end of the same attribute. For him, most situations would provide "too much" control. Other persons might have ideals at intermediate portions of the attribute; hence, situations might offer "too much", "too little", or the right amount of control, or the other interpersonal needs. These multiple types of relations between an interpersonal need and satisfaction with the situation are illustrated, for "control", in figure 2. An effective model of interpersonal relations should be complex enough to handle all four of these "types" of relation for any dimension of interpersonal relations which is to be included in that model.

2. Interpersonal Relations as Subjective Experience

Even the four types of relation between an individual's ideal or desired level for a given need and the situation's potential for fulfilling that need, which were presented in the previous section, do not fully describe all of the important facets of even a single dimension of interpersonal relations. Two additional facts must be taken into account. First, we are concerned with the individual's interpersonal situation, as experienced, and this is inherently a subjective matter. Not only does the "ideal" level vary from one individual to another, but the subjective meaning of a given situation (e.g. how much influence pressure it "contains") is largely a matter for individual interpretation. This is not to say that it is not possible to obtain reliable measures of the presence of influence pressures, for example, by the use of skilled observers. Rather, we are here saying that the individual's own perception of the situation plays more of a part in determining his reaction to it than does the "true" nature of the situation as judged by the observer.

Furthermore, individuals probably vary in the extent to which this satisfaction with situations is sensitive to variations of a given interpersonal condition in those situations. Some individuals may be relatively insensitive to

variations in interaction rate, but respond very sensitively to differences in "control" or "influence".

These two aspects -- the subjective interpretation of interpersonal situations, and individual differences in sensitivity to given interpersonal conditions, are further elaborated in the following reformulation.

Let us assume that individuals vary in their "ideal" interaction rates. We can represent the "forces toward interaction" in a situation as varying along a Task B type, monotonic scale. Similarly, we can represent the individual's degree of satisfaction with the situations as varying along an orthogonal scale. If these two axes are used as the vertical and horizontal diameters of a circle, as in figure 3, the four quadrants can be characterized as follows:

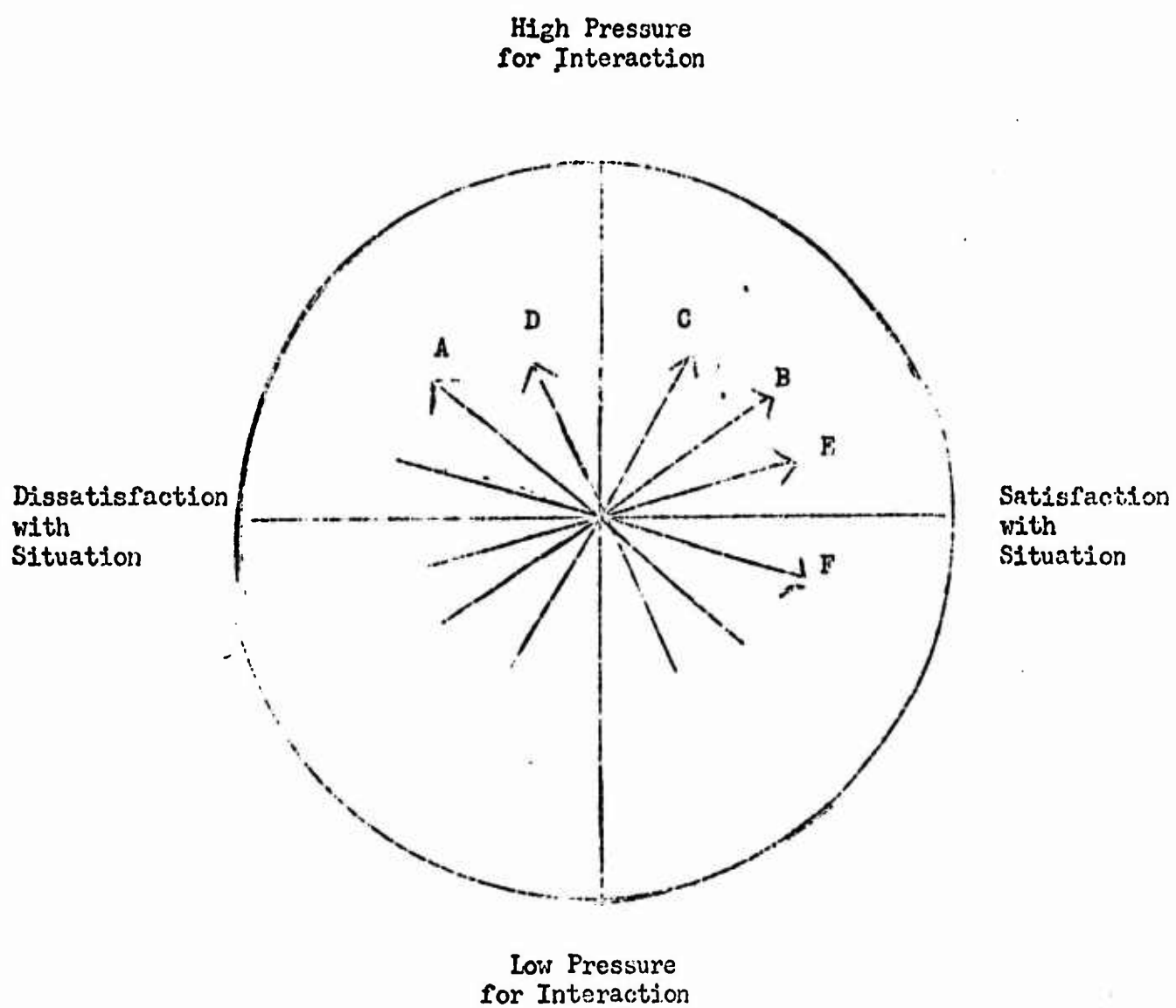
1. The northwest quadrant is the area of lack of privacy, or too much interaction (high pressure for interaction, which is negatively interpreted by the individual).
2. The northeast quadrant is the area of inclusion, belongingness, congeniality (high pressure for interaction, which is positively interpreted by the individual).
3. The southeast quadrant is the area of privacy (low pressure for interaction which is interpreted favorably).
4. The southwest quadrant is the area of isolation (low pressure for interaction which is interpreted unfavorably).

We can represent an individual as a line through the center of this circle, with the slope of the line indicating how the individual's satisfaction with the situation varies with the "pressure for interaction" in that situation. Here, again, four "types" can be distinguished:

- (a) Persons whose satisfaction varies inversely with pressure for interaction (line A in figure 3).
- (b) Persons whose satisfaction varies directly with pressure for interaction (line B in figure 3).
- (c) Persons whose satisfaction remains relatively neutral over wide variations in degree of pressure for interaction (lines C and D in figure 3).
- (d) Persons whose satisfaction varies widely even though the situation(s) offer relatively moderate and constant pressures for interaction (lines E and F in figure 3).

Figure 3

Illustration of Types of Subjective Reactions to Variations
in an Interpersonal Condition (Interaction)



This diagram illustrates the fundamental fact that the meaning of an interpersonal interaction, to a given individual, is inherently subjective. A situation high in pressure for interaction may be interpreted as "inclusion" (hence, good), or as "intrusion" (hence, bad), by different individuals. A situation with a low pressure (opportunity) for interaction can be viewed as "isolation" or as "privacy". Similarly, high interpersonal influence can be viewed as "guidance" or as "constraint", while low interpersonal influence can be viewed as "ambiguity" or "freedom". Very high positive attraction can be seen as "over-dependence" or as "love and friendship". Neutral affect relations can be seen as "aloofness, lack of warmth", or as "poise, restraint, self-sufficiency".

The diagram also illustrates the notion that individuals vary in sensitivity to differences in a given interpersonal condition. Types A and B are highly sensitive, while types C and D are relatively insensitive.

Finally, the non-monotonic types of relations discussed previously (see fig.2) can be represented as curved lines in this circle. If the curve has its ends in in quadrants 2 and 3, then "too much" inclusion is interpreted as "intrusion", "too little" is seen as isolation, and intermediate amounts are seen as a balance between belongingness and privacy.

✓ An adequate model of interpersonal relations should be constructed so as to take into account subjective interpretations of the interpersonal properties of situations, as well as "objective" indices of those properties. Furthermore, it should include consideration of the relative sensitivity of an individual with respect to each particular interpersonal property. As with preceding considerations, our present discussion again points to the need for a relatively complex model, if it is to serve as an accurate guide for subsequent theoretical and empirical analyses of interpersonal relations.

D. Some Formulations Toward a Criterion Model for Investigating Interpersonal Relations in Small, Isolated Groups

The following pages present portions of a tentative model which appears to be useful in criterion analyses of interpersonal relations in small, isolated groups. It is based on the "elements" discussed in section B of this paper, and on the structural concepts discussed in section C. It should be noted that the model, as here presented, is by no means complete, nor is it considered fixed and final. Rather, it is an attempt to sum up the many concepts touched upon in prior parts of this paper, in a manner which organizes them but still does justice to the complexity of the subject matter. It also should be noted that the model is not intended to be a substantive theory, in the sense of a body of substantive postulations about how optimal interpersonal relationships in a group can be achieved. Rather, it is intended to be a descriptive tool for criterion analyses of the state of interpersonal relationships which do obtain in groups. However, it is necessary to build the model upon a series of assumptions, and these tend to have implications for substantive theory.

1. Basic Assumptions

Let us assume that we can define a set of individuals, $\{M\}$, (for the sake of simplicity of typing, we will hereafter drop the symbol of $\{M\}$ and refer to "the set, M".) containing persons 1, 2, 3, ..., i, j,m, who form a closed pool of potential interaction partners for an extended period of time.

Let us also assume that we can define a molar unit of time, T, (such as a "day", a "watch"), within which a meaningful episode of interaction (can) take place. Let us divide the period T into a number of molecular time periods, $t_1, t_2, \dots, t_k, \dots, t_l$, such that a single unit of interaction can take place in t_k .

2. Probability of Interaction of i with j

For any pair of individuals, i and j, in the set M, there is a probability of interaction between them in time t_k , which will be expressed by the term

(p) I_{ijt} . This probability is a function of:

- a. The predisposition of i, and of j, to interact (to communicate, to catharse) in time period T. This will be expressed as C_{iT} and C_{jT} .
- b. The attraction between i and j, relative to their attraction to other available interaction partners (within the set M).
- c. The relative statuses of i and j, as perceived by i and j.

a. Predisposition to Interact Affects Probability of Interaction.

An individual's predisposition to interact, C_{iT} , is based on his desired level of interpersonal activity, which is considered as a region, Z, on a continuum of amount of interaction, which is relatively stable for a given individual in period T. The difference between the amount of interaction in which i has engaged up to any given point, t_{k-1} , and his desired amount of interaction in T, (his Z_{iT}), represents the "strength of the force to interact" in t_k . That force will be represented as C_{itk} . If actual interaction is less than desired interaction, the force is positive. If actual interaction exceeds desired interaction, the force represented by C_{it} is negative or inhibitive. If actual interaction matches Z_{iT} the force or predisposition to interact is zero.

b. Attraction and Status of Potential Partners Affect Probability of Interaction.

While an individual's predisposition to interact in t_k is tied to his desired level and his prior interaction, his probability of interaction is also affected by the relative attractiveness of potential interaction partners. For each i, there is a preference order P_i , which expresses his relative attraction to all other individuals in the set M. (P_i can be expressed either as a rank order on

the set M , or as three ordered classes of the set M , namely, \neq , 0 , and \dots .) The probability that i will interact in t_k is a function of the rank in P_i of those j 's with whom i can interact in t_k (that is, those j 's which situational circumstances make available/possible as interaction partners for i). Hence regardless of the level of C_{iT} at t_k , individual i will be more likely to interact with j if j is high in P_i (or is \neq in P_i) than if j is low (or $-$) in P_i . Hence, the availability of desirable interaction partners will tend to increase the probability of interaction by i , over and above a positive "force for interaction", and in spite of a negative or neutral force for interaction, C_{iT} . Conversely, the lack of availability of desirable interaction partners will tend to reduce the probability of interaction even when C_{iT} is a positive force (that is, when interaction has not yet reached the desired level (Z_{iT})).

The probability of interaction of i and j also depends on their perceptions of each other's statuses relative to other potential interaction partners. For each i , there is an order, R_i , on the set M which expresses i 's perception of the relative status/power/influence of members of the set M . Note that i , himself, is in R_i , although i is not in P_i . Hence, the place of any individual, j , in R_i , can be expressed either as the rank of j in R_i or as positive ($j > i$), equal ($j \sim i$) or negative ($j < i$).

The higher the rank of i in R_i , the more i is likely to interact and to be interacted with (i.e. to initiate interaction and to be the target of interaction initiated by others). The higher the rank of j in R_i , the more i is likely to initiate interaction with j , rather than with other potential partners. However, the higher i 's rank in R_i relative to j 's rank (i.e. if $R_{ij} - R_{ji}$ is negative), the less likely that i will initiate interaction with j , if other potential interaction partners higher than j in R_i are available.

However, the degree to which probability of interaction of i with j is dependent on j 's attraction and/or status for i may vary from one individual to another. It is always more likely that i will interact with j rather than

1 if j is higher than 1 in R_1 or in P_1 . But the extent to which a difference in attraction ($P_{1j} - P_{11}$), or in perceived status ($R_{1j} - R_{11}$) affects the resulting probability of interaction by i with j or 1 is considered a "weight" (W_{1P} and W_{1R} , for attraction and status respectively) which is a constant for the individual (a "personality characteristic"?) but varies from one individual to another.

The notion of W_{1P} is that individuals differ in their "sensitivity to differences in interpersonal attraction of available interaction partners, j and 1". This notion is related to Schutz's concept of individual differences in the need for interpersonal affect, but is more closely tied to our reconstruction of that concept as indicated in figure 3. Here, we are suggesting (perhaps in contrast to Schutz) that interaction with more attractive others is always at least as desirable as interaction with less attractive others, but that the degree of sensitivity to differences in attraction (hence, the degree that probability of interaction varies with attractiveness of available interaction partners) differs from one person to another.

Similarly, the notion of W_{1R} is that individuals differ in their "sensitivity to differences in statuses of available interaction partners, j and 1". This notion suggests that individuals differ in how "status-oriented" they are, with some persons basing choice of interaction partners largely on perceived (relative) statuses of the others, while other individuals are relatively insensitive to such status differences. (Such differences may be of special significance for military groups, which have fixed and explicit rank structures, when those groups are placed in a situation of extended isolation as a "closed human ecology". (For example, see Torrance, 1954.)

c. Summary.

We can summarize these formulations as follows: the probability of interaction between i and j in time t is a joint function of: i 's "force to interact", his

attraction for j, and his perception of j's status relative to himself and to others in the set M; and these same factors for j. Hence, the probability of interaction of i and j in t:

$$(p) I_{ijt} = (f) (C_{iT}) \left[(P_{ij} W_{iP}) \left[R_{ij}(R_{ij} - R_{ii}) W_{iR} \right] \right. \\ \left. (C_{jT}) \left[(P_{ji} W_{jP}) \left[R_{ji}(R_{ji} - R_{jj}) W_{jR} \right] \right] \right],$$

The expected amount of interaction between i and j during situation T, then, is the cumulative value of the above probability for all t in T:

$$(E) I_{ijT} = \left(\sum_{t=1}^T (p) I_{ijt} \right). \text{ (note that } C_{it} \text{ diminishes as interaction occurs, and can take a negative value.)}$$

The expected amount of total interaction by i during T is the cumulative value of the above expected value for all j in the set M:

$$(E) I_{i.T} = \sum_{j=1}^{m-1} \left(\sum_{t=1}^T (p) I_{ijt} \right)$$

3. Interpersonal Satisfaction

The overall interpersonal satisfaction which an individual, i, derives from a situation, T, will be expressed as ϕ_{iT} . That interpersonal satisfaction depends on two factors of the interaction situation, namely: (a) how much i interacts; and (b) with whom he interacts.

a. Amount of Interaction Affects Satisfaction.

The overall interpersonal satisfaction which an individual, i, derives from a situation, T, depends on the degree to which the amount of his actual interaction with others during T matches his desired amount of interaction. That is, interpersonal satisfaction, ϕ_{iT} , increases as the "force to communicate", C_{iT} , approaches zero. The individual's actual interaction may exceed or be less than his desired amount, since the situation may provide more or less pressure (or more

or less opportunity) for interaction quite apart from i 's desired level of interaction. The situational pressures for communication derive both from the relative attraction and status of other individuals who are available as potential interaction partners, and from exigencies deriving from the group's task and environment.

b. Attraction and Status of Interaction Partners Affects Satisfaction.

The individual's overall interpersonal satisfaction from T also depends on a second factor, in addition to the matching of amount of interaction with desired amount, namely: the relative attraction and status of those with whom i does interact. Interaction with an attractive other, j , is satisfying in and of itself, regardless of C_{iT} . Interaction with a j of higher status is satisfying in and of itself, regardless of C_{iT} . However, the degree to which differences in attraction, or in status, of partner makes for differences in satisfaction which i derives from the interaction, probably vary from one individual to another. Hence, we will represent the individual i 's sensitivity to differences in attraction by the weight, W_{iP} , and the individual's sensitivity to differences in status by the weight, W_{iR} , as we did in considering the effects of attraction and status on probability of interaction. Thus, we are assuming that the individual's sensitivity to attraction and status has a parallel effect on his probability of interaction with various possible partners and on the interpersonal satisfaction which he derives from such an interaction.

Thus, if i has a low level of interaction in T (relative to his desired level), his lack of satisfaction is somewhat compensated for if much of his actual interaction has been with j 's who are attractive to i or who are perceived by i as having high status (i.e., j 's who are high in P_i or R_i). If the individual has interacted far more than his desired level in T , that "oversaturation" is less dissatisfying if it has come about through interaction with attractive or high

status persons (i.e., j's who are high in P_i or R_i). Conversely, dissatisfaction from "too little" or "too much" interaction is intensified if the interaction has been with negatively attractive others or others seen as low in status (i.e. j's low in P_i or R_i). However, the degree to which satisfaction is enhanced by interaction with attractive or high status others (and the degree to which it is diminished by interaction with negatively attractive or low status others) varies from one individual to another. This variation is expressed in the individual "weights", W_{iP} and W_{iR} , for "sensitivity" to attraction or influence, respectively.

C. Summary.

These formulations can be summarized as follows:

The overall amount of interpersonal satisfaction which an individual, i , derives from a situation, T , is expressed as Φ_{iT}

$$\Phi_{iT} = \left[\sum_{t=1}^T \sum_{j=1}^{m-1} (I_{ijt}) \left[(P_{ij}W_{iP}) + R_{ij}(R_{ij} - R_{ii}) W_{iR} \right] \right] - (C_{iT}).$$

The term, C_{iT} stands for the unresolved force to communicate for individual, i , at the end of situations T . $C_{iT} = \left| \left(\sum_{t=1}^T I_{i,t} \right) - (Z_{iT}) \right|$

The term, $I_{i,t}$, expresses the amount of actual interaction of i with (all) other individuals in time t . Since t is defined as a time period containing a unit interaction, then $I_{i,t}$ is either 1 or 0 for a given t .

The term, Z_{iT} , refers to i 's desired level of interaction, considered as a constant for i for period T , which is defined as a range of amount of interaction rather than a specific amount. Thus, at time t_1 , the "force for interaction", C_{iT} , equals the desired level, Z_{iT} (or, more strictly speaking, the lower bound of the desired region, Z_{iT}), since interaction is considered to be at zero at the

onset of the period T. At time t_k , the force $C_{itk} = \left(\sum_{t=1}^{k-1} I_{i.t} \right) - (Z_{iT})$.

The term, I_{ijt} , refers to i's interaction with j in time t. It can be 1 or 0.

The term, P_{ij} , refers to i's preference for j. It is defined both in terms of rank preference for j relative to the set M; and in terms of direction of preference (/ , 0 , -) for j. Thus, P_{ij} is a rank with a sign. (individual i is not represented in P_i .) The term, W_{ip} , is a "weight" expressing the sensitivity of i's satisfaction to differences in partner attraction.

The term, R_{ij} , refers to i's perception of j's status or power, relative to the set M. The term, R_{ii} , refers to i's perception of his own power relative to the set M. (Individual i is represented in R_i .) The term, W_{iR} , is a "weight" expressing the sensitivity of i's satisfaction to differences in partner status.

4. Extension of the Model over Situations

The foregoing presentation has presumed that each molar unit of time, T, can be construed as an independent situation, even for a "closed pool of potential interaction partners." If this were the case, extension of the model over situations, T_1, T_2, \dots, T_n , would be a simple matter of reapplication of the concepts to each time period. However, it is obvious that this assumption is not true. Interaction in any group has a history; and the history of prior interactions is of particular significance for groups under conditions of long-run physical and communication isolation.

It is probable that such concepts as "force for interaction" carry over from one situation, T_1 , to the next, T_2 , as unresolved "needs" which alter the initial desired level of interaction (Z) in the next situation. Thus, an individual who has "under-interacted" is even more prone to interaction in his next situation -- as with the individual who has just completed a solitary watch, or

monitoring task under low stimulus input conditions. On the other hand, an individual who has just "over-interacted" is probably more prone to avoid interaction and seek privacy during the next temporally-defined situation. However, both of these possibilities represent reactions to a prior, unsatisfying situation, which in themselves do not necessarily add to the interpersonal satisfaction likely to be derived from the subsequent situation.

Furthermore, since humans have memories which extend well beyond the immediately prior temporal interval, interaction in a given situation, and its results (in terms of satisfaction) have consequences for all subsequent situations. In effect, the results of interaction in prior situations alter the input conditions for the next situation. For example, the occurrence of interaction by i with a particular other, j , may tend to increase j 's positive attraction for him (if he was positive) or to increase his negative attraction to i (if he was negative). Similarly, the results of interaction, in terms of influence of one person on another, may alter the perceived status of the individuals concerned.

Furthermore, the desired level of interaction may also vary from situation to situation for the same individual, even without prior unsatisfactory events such as described above. Some kinds of situations may require or induce more interaction from a given individual, while other types of situations may inhibit or reduce his level of interaction, over and above those effects produced by the attractiveness and status of the available pool of interaction partners.

These considerations represent shortcomings of the model as presently formulated, and point to the extreme complexity needed in a final, complete model. They do not reduce the potential gain to be had from application of a model such as the one presented here, but rather indicate that this tentative model is yet far too "sketchy" on many questions for immediate applicability. The final part of this section is a brief discussion of some of the ways in which

this model -- when adequately modified and verified -- can be applied as a basis for a criterion system for the investigation of interpersonal relations in small, isolated groups.

5. Measurement and Prediction of Interpersonal Satisfaction

The model just described provides a set of terms for measuring interpersonal satisfaction in an interaction situation. Only six terms are necessary for (indirect) measurement of derived interpersonal satisfaction, if the concepts and relationships assumed in the model are correct. These six terms are:

- (a) P_i , which is i 's preference judgments on members of the set M .
- (b) R_i , which is i 's perceptions of the relative status of members of the set M .
- (c) I_{ijt} , which is the tabulation of the interaction of i with j , in t , for each j in the set M and each t in T .
- (d) Z_{iT} , which is i 's "desired region of interaction" during T .
- (e) W_{iP} , which is i 's "sensitivity to attraction differences".
- (f) W_{iR} , which is i 's "sensitivity to perceived status differences."

Furthermore, the first three of these concepts are clearly operationalizable, while the latter three appear to be capable of fairly precise operational definition. The first term listed above is the traditional sociometric ranking data, while the second is a sociometric ranking in terms of perceived status, rather than personal attraction. Both kinds of data can be obtained readily from a "closed pool" of potential interaction partners. The third term requires only a record of "who interacted with whom" in each molecular time interval of each molar time period. The latter three terms are the kinds of concepts implied in many studies of individual differences in interpersonal needs, interpersonal perception habits, interactional predispositions, etc., as discussed in sections B and C of this paper. They can probably be put in operational form so that

the question of individual differences in them can be evaluated empirically. (It should be noted that, if no such differences exist, these terms can be dropped or represented by a constant for all i with a greatly simplifying effect on the overall model.)

It is also possible to utilize the model (once it has been shown to have at least heuristic value in measuring interpersonal satisfaction, of course) for the prediction of interpersonal satisfaction which various individuals will derive from a given interpersonal situation. One might want to make such a prediction, for example, as part of an experiment to test hypotheses concerning composition or organization variables. To apply the model as a basis for prediction of interpersonal satisfaction, the probability of interaction of i and j (and the expected value terms for interaction of i in T) can be substituted for the actual interaction term ($I_{i,t}$). Then, one could "game out" interaction pattern and derived satisfaction for subsequent time intervals, t , by (Monte Carlo) drawing from a set of random numbers with respect to those probability-of-interaction values. The probability of interaction of i and j is based entirely on the other five terms listed above. Hence, it can be calculated for any set of individuals for whom attraction and status rankings, desired interaction levels, and sensitivities to attraction and status, are available (or are assumed for "simulation" purposes).

The latter feature of this model permits a ready check on the validity of the probability-of-interaction formulations, by computing such probabilities from the other data mentioned above, for a set of individuals free to interact, and then attempting to predict to the obtained amount ($I_{i,t}$) and pattern (I_{ijt}) of interaction which actually occurs. If such predictions support the formulations of the model regarding probability of interaction, and appropriate "external evidence" could be found to support the formulations concerning derived interpersonal satisfaction, then the model (or modifications of it based on further research) should

provide at least a useful descriptive base for a criterion system for investigation of interpersonal relations in small, isolated military groups.

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